

SECRETARIA GENERAL TECNICA
DIRECCION DE SEGURIDAD
UNIDAD DE SALUD LABORAL

CENTRO
DE INVESTIGACIONES
ENERGETICAS
MEDIOAMBIENTALES
Y TECNOLOGICAS

Oiemat

MEDICAL SURVEILLANCE METHODOLOGY

MEDICAL SURVEILLANCE

C.I.E.M.A.T.
OCCUPATIONAL MEDICINE DIVISION

AIMS OF THE LONG-TERM MEDICAL SURVEILLANCE

- 1. Assess the current health status of the exposed people.**
- 2. Identify any state of health or small anomaly that might increase the individual sensitivity to diseases (related and not related with radiation exposure)**
- 3. Establish the morphological and functional conditions of those organs and systems involved in the stages of internal contamination (intake, uptake deposition and elimination).**
- 4. Detect in the shortest possible time any disorder or illness which might be due to ionizing radiation.**

5. Try to decrease some degree o
psychological stress and anxiety
(sometimes named "radiophobia").

6. Maintain and keep updated detailed
medical records.

MEDICAL SURVEILLANCE METHODOLOGY

- The medical surveillance is based on the general principles of occupational medicine.
- It is carried out by routine medical examinations. These examinations do not differ basically from those carried out in industrial medicine.
- The methods of the medical examinations and clinical tests used are those employed routinely at the Occupational Medicine Division a C.I.E.M.A.T.

MEDICAL EXAMINATION PROCEDURES

- Medical history
 - Physical examination
 - Resting electrocardiogram
 - Pulmonary spirometry
 - Audiometry
 - Visual acuity test
 - Complete blood count
 - Blood chemistry test
 - Clinical urinalysis
 - X-Ray examinations
 - Ultrasound examinations
- * Not in a routine way

MEDICAL EXAMINATION PROTOCOL

1. IDENTIFICATION AND ADMINISTRATIVE INFORMATION

- Name
- ID number
- Social Security number
- Sex
- Birthdate
- Place of birth
- Address
- Telephone number

Etc.

2. OCCUPATIONAL HISTORY

- Current and previous jobs
- Exposure agents in the workplaces (if they are known)

3. FAMILY HISTORY

- Health problems in ascendants, collaterals and descendants.

4. PERSONAL HISTORY

- Health disorders, diseases, surgical treatments, etc.
- Injuries
- Habits
 - . Tobacco
 - . Alcohol
 - . Other toxics and drugs
- Allergic diseases
- Vaccinations

5. CLINICAL HISTORY

- Current symptoms and clinical signs

6. PHYSICAL EXAMINATION

- ANTHROPOMETRICAL DATA
(weight, height, morphology, etc.)
- DERMATOLOGICAL EXAMINATION
- CARDIOVASCULAR EXAMINATION
(blood pressure, heart and large arteries sound, etc.)
- RESPIRATORY SYSTEM EXAMINATION (chest sound, upper respiratory tract, etc.)
- DIGESTIVE TRACT EXAMINATION
(upper tract, digestive function and special attention to the liver function)

- URINARY SYSTEM EXAMINATION
(special attention to the kidneys functional status)
- NEUROLOGICAL SYSTEM EXAMINATION (co-ordination, reflexes, etc.)
- ENDOCRINE GLANDS EXAMINATION
- SENSE ORGANS EXAMINATION
(eyes, mouth, ear, nose, and throat)

7. CLINICAL TESTS

- RESTING ELECTROCARDIOGRAM
- PULMONARY VENTILATION TEST
- VISUAL ACUITY TEST
- AUDIOMETRY
- X-RAY EXAMINATIONS *
- ULTRASOUND EXAMINATIONS *

* If necessary.

8. HAEMATOLOGICAL TESTS

- TOTAL AND DIFERENTIAL BLOOD COUNT
 - . Erythrocytes
 - . Reticulocytes
 - . Total leucocytes
 - . Granulocytes: neutrophils, basophils, eosinophils.
 - . Lymphocytes
 - . Monocytes
 - . Trombocytes
- MCV (mean corpuscular erythrocyte volume)
- MPV (mean platelet volume)
- MORPHOLOGICAL STUDY OF THE CELLS

- HEMOGLOBIN CONCENTRATION
 - . MCH (mean corpuscular hemoglobin)
 - . MCHC (mean corpuscular hemoglobin concentration)
- HEMATOCRIT
- HAEMOSTASIS TESTS

9. BIOCHEMICAL TESTS

- Glucose
- Urea
- Creatinine
- Uric acid
- Cholesterol
- High density cholesterol
- Low density cholesterol
- Triglycerides
- Apolipoprotein A-I
- Apolipoprotein B
- SGOT
- SGPT
- Gamma GTP
- Total bilirubin
- Direct bilirubin
- Indirect bilirubin
- Alkaline phosphatase

- . Total acid phosphatase
- . Prostatic phosphatase
- . LDH
- . Amylase
- . Total protein
- . Calcium
- . Iron
- . Sodium
- . Potassium
- . Protein electrophoretic
 - . Albumin
 - . Alpha-1 globulin
 - . Alpha-2 globulin
 - . Beta globulin
 - . Gamma globulin
- . Immunoglobulin G
- . Immunoglobulin A
- . Immunoglobulin M

10. CLINICAL URINALYSIS TESTS

- PHYSICAL AND CHEMICAL ANALYSIS**
- SEDIMENT ANALYSIS**

HAEMATOLOGICAL TESTS. PRINCIPLE OF MEASUREMENT

PARAMETER	UNITS	LINEAR RANGE	PRECISION (CV)
Erythrocytes	$\times 10^6$ cells/ μ l	0-7	< 2.0 %
Hemoglobin	g/dl	0-25	< 1.0 %
Hematocrit	%	-	-
MCV	fL	50-200	< 2.0 %
MCH	pg/cell	-	-
MCHC	g/dl	-	-
Leucocytes	$\times 10^3$ cells/ μ l	0-99.9	< 2.0 %
Trombocytes	$\times 10^3$ cells/ μ l	0-999	< 4.0 %
MPV	fL	5-20	< 2.2 %

CELL COUNTING AND SIZING: Detection and measurement of changes in electrical resistance produced by particle (COULTER METHOD).

HEMOGLOBINOMETRY: Single-beam photometer.

CLINICAL URINALYSIS TESTS. PRINCIPLE OF MEASUREMENT

<u>PARAMETER</u>	<u>METHOD</u>	<u>WAVELENGTH (nm)</u>	<u>UNITS</u>	<u>WAVE RANGE</u>
pH	Methyl red and bromothymol indicators	634	-	5-9
Glucose	Specific glucose-oxidase/ peroxidase reaction	608	mg/dl	0-300
Protein	Protein error of a pH indicator	557	mg/dl	0-500
Ketone bodies	Legal's test principle	608	mg/dl	0-150
Bilirubin	Coupling of bilirubin with diazonium salt	557	mg/dl	0-12.0
Urobilinogen	Coupling of bilirubin with diazonium salt	557	mg/dl	0-12.0
Leucocytes	Granulocytes sterase reaction	557	cells/ μ l	0-500
Erythrocytes	Hydroperoxide oxidation catalyze by hemoglobin	665	cells/ μ l	0-250

Multichannel reflectance photometer analyzer

BIOCHEMICAL TESTS. PRINCIPLE OF MEASUREMENT

PARAMETER	METHOD	SAMPLE	WAVELENGTH (nm)	UNITS	LINEAR RANGE
GLUCOSE	Hexokinase	serum or plasma	492-550	mg/dl	10-560
UREA	Urease	serum or plasma	340	mg/dl	0-300
CREATININE	Jaffé's principle	serum	404	mg/dl	0-6
CHOLESTEROL	CHOD-PAP	serum	500	mg/dl	0-500
HDL-CHOLESTEROL	CHOD-PAP	serum	500	mg/dl	-
TRIGLYCERIDES	Lipase/GPO/PAP	serum	458	mg/dl	0-1000
URIC ACID	Uricase/PAP	serum	520	mg/dl	0-18
SGOT	Form IFCC	serum	340	U/l	0-442
SGPT	Form IFCC	serum	340	U/l	0-442
GAMMA GTP	Form DGKC	serum	405	U/l	0-400
TOTAL BILIRUBIN	DMSO/DIAZO	serum	548	mg/dl	0-15
DIRECT BILIRUBIN	DIAZO	serum	548	mg/dl	0-15
LDH	Form DGK modified	serum	340	U/l	0-1000
ALKALINE PHOSPHATASE	Bowers Mc Comb's test	serum	404	U/l	0-800
TOTAL ACID PHOSPHATASE	Hillman's principle	serum	404	U/l	0.35
PROSTATIC PHOSPHATASE	Hillman's principle	serum	404	U/l	0.35
AMYLASE	Maltohexosidase	serum or plasma	450	U/l	-
TOTAL PROTEIN	Büret's principle	serum	550	g/dl	0-15
CALCIUM	Arsenazo III	serum	550	mg/dl	0-16
IRON	Ferrozine	serum	628	µg/dl	0-1000